

C L A I M S

1. A fiber optics transmission line characterized in that

5 single or a plurality of a graded index fiber is inserted in the middle of a transmission line formed by a single mode fiber, the single mode fiber including a core having a predetermined refractive index and a cladding having a refractive index smaller than that of the core.

10 2. The fiber optics transmission line according to claim 1, characterized in that

the graded index fiber is fusion spliced to the single mode fiber in the middle of the fiber optics transmission line.

15 3. The fiber optics transmission line according to claim 1, characterized in that

the inserted graded index fiber is so designed that its mode field diameter gradually increases from a light entry side and decreases toward a light exit side.

20 4. The fiber optics transmission line according to claim 3, characterized in that

the length of the graded index fiber having a mode field diameter gradually increasing from a light entry side and decreasing toward a light exit side is 1/2 of a pitch, where one pitch denotes a length of the transmission line

25 corresponding to one cycle during which the mode filed diameter of a light periodically changes along the transmission line.

5. The fiber optics transmission line according to claim 4, characterized in that

the length of the graded index fiber having a mode field diameter gradually increasing from a light entry side and the length of the graded index fiber having a mode filed diameter decreasing toward a light exit side, are both 1/4 of a pitch.

5 6. The fiber optics transmission line according to claim 3, characterized in that

a single mode fiber having an expanded mode field diameter is inserted between the graded index fiber having a mode field diameter gradually increasing from a light entry side and the graded index fiber having a mode filed diameter decreasing toward a light exit side.

7. The fiber optics transmission line according to claim 3, characterized in that

a single mode fiber having a mode field diameter smaller than the expanded mode field diameter of the graded index fiber is inserted between the graded index fiber having a mode field diameter gradually increasing from a light entry side and the graded index fiber having a mode filed diameter decreasing toward a light exit side.

20 8. The fiber optics transmission line according to claim 3, characterized in that

the expanded mode field diameter of the graded index fiber falls within a range from 15 to 85 μm .

9. The fiber optics transmission line according to claim 25 8, characterized in that

the expanded mode field diameter of the graded index fiber falls within a range from 15 to 65 μm .

10. The fiber optics transmission line according to claim 3, characterized in that

the core diameter of the graded index fiber is 1.5 times or more the expanded mode field diameter of the graded index fiber, which is obtained at a location 1/4 of a pitch from the light entry side thereof.

5 11. The fiber optics transmission line according to claim 10, characterized in that

the core diameter of the graded index fiber is 2 times or more the expanded mode field diameter of the graded index fiber, which is obtained at a location 1/4 of a pitch from the 10 light entry side thereof.

12. The fiber optics transmission line according to claim 1, characterized in that

the graded index fiber is connected to the single mode fiber through a connector in the middle of the fiber optics 15 transmission line.

13. The fiber optics transmission line according to claim 12, characterized in that

the inserted graded index fiber is so designed that its mode field diameter gradually increases from a light entry 20 side and decreases toward a light exit side.

14. The fiber optics transmission line according to claim 13, characterized in that

the length of the graded index fiber having a mode field diameter gradually increasing from a light entry side and 25 decreasing toward a light exit side is 1/2 of a pitch, where one pitch denotes a length of the transmission line corresponding to one cycle during which the mode field diameter of a light periodically changes along the transmission line.

15. The fiber optics transmission line according to
claim 14, characterized in that

the length of the graded index fiber having a mode field
diameter gradually increasing from a light entry side and the
5 length of the graded index fiber having a mode filed diameter
decreasing toward a light exit side, are both 1/4 of a pitch.

16. The fiber optics transmission line according to
claim 13, characterized in that

10 a single mode fiber having an expanded mode field
diameter is inserted between the graded index fiber having a
mode field diameter gradually increasing from a light entry
side and the graded index fiber having a mode filed diameter
decreasing toward a light exit side.

15 17. The fiber optics transmission line according to
claim 13, characterized in that

17 a single mode fiber having a mode field diameter smaller
than the expanded mode field diameter of the graded index
fiber is inserted between the graded index fiber having a mode
field diameter gradually increasing from a light entry side
20 and the graded index fiber having a mode filed diameter
decreasing toward a light exit side.

18. The fiber optics transmission line according to
claim 13, characterized in that

25 the expanded mode field diameter of the graded index
fiber falls within a range from 15 to 85 μm .

19. The fiber optics transmission line according to
claim 18, characterized in that

the expanded mode field diameter of the graded index
fiber falls within a range from 15 to 65 μm .

20. The fiber optics transmission line according to
claim 13, characterized in that

the core diameter of the graded index fiber is 1.5 times
or more the expanded mode field diameter of the graded index
5 fiber, which is obtained at a location 1/4 of a pitch from the
light entry side thereof.

21. The fiber optics transmission line according to
claim 20, characterized in that

the core diameter of the graded index fiber is 2 times or
10 more the expanded mode field diameter of the graded index
fiber, which is obtained at a location 1/4 of a pitch from the
light entry side thereof.

22. The fiber optics transmission line according to
claim 1, characterized in that

15 the graded index fiber is connected to the single mode
fiber through a V-groove in the middle of the fiber optics
transmission line.

23. The fiber optics transmission line according to
claim 22, characterized in that

20 the inserted graded index fiber is so designed that its
mode field diameter gradually increases from a light entry
side and decreases toward a light exit side.

24. The fiber optics transmission line according to
claim 23, characterized in that

25 the length of the graded index fiber having a mode field
diameter gradually increasing from a light entry side and
decreasing toward a light exit side is 1/2 of a pitch, where
one pitch denotes a length of the transmission line
corresponding to one cycle during which the mode filed

diameter of a light periodically changes along the transmission line.

25. The fiber optics transmission line according to claim 24, characterized in that

5 the length of the graded index fiber having a mode field diameter gradually increasing from a light entry side and the length of the graded index fiber having a mode filed diameter decreasing toward a light exit side, are both 1/4 of a pitch.

26. The fiber optics transmission line according to 10 claim 23, characterized in that

a single mode fiber having an expanded mode field diameter is inserted between the graded index fiber having a mode field diameter gradually increasing from a light entry side and the graded index fiber having a mode filed diameter 15 decreasing toward a light exit side.

27. The fiber optics transmission line according to claim 23, characterized in that

a single mode fiber having a mode field diameter smaller than the expanded mode field diameter of the graded index 20 fiber is inserted between the graded index fiber having a mode field diameter gradually increasing from a light entry side and the graded index fiber having a mode filed diameter decreasing toward a light exit side.

28. The fiber optics transmission line according to 25 claim 23, characterized in that

the expanded mode field diameter of the graded index fiber falls within a range from 15 to 85 μm .

29. The fiber optics transmission line according to claim 28, characterized in that

the expanded mode field diameter of the graded index fiber falls within a range from 15 to 65 μm .

30. The fiber optics transmission line according to claim 23, characterized in that

5 the core diameter of the graded index fiber is 1.5 times or more the expanded mode field diameter of the graded index fiber, which is obtained at a location 1/4 of a pitch from the light entry side thereof.

31. The fiber optics transmission line according to
10 claim 30, characterized in that

the core diameter of the graded index fiber is 2 times or more the expanded mode field diameter of the graded index fiber, which is obtained at a location 1/4 of a pitch from the light entry side thereof.